ON THE ARRANGEMENT AND CONSTRUCTION OF HOUSE DRAINS.

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The attention of the public being now very much drawn to the subject of house drainage, it would appear to be extremely desirable that clear views of the elementary principles of the subject should receive the utmost publicity, to the intent that a better mode should speedily succeed the present bad and inefficient system of building house drains. And as I have found much difficulty in procuring information upon many points which require elucidation, I have ventured, as a practical man, to throw together a few thoughts, being anxious to add my mite to the general stock of knowledge upon this subject.

A system of perfect drainage is, in a sanitory point of view, of paramount importance, for without it no habitation can be considered as a fit place of residence, the general health and comfort of the inhabitants of every dwelling being very sensibly affected by it. There are a great many confined and densely-populated localities in and about London where the want of house drainage is evidently very apparent, All the refuse water and matter at these places, from not being carried off, accumulate, saturating the whole extent of the adjacent ground to the depth of several inches, thus producing boggy tracts of black, stagnant, and putrid matter. The exhalations evolved from the decomposition of these accumulations are of the most noisome and intolerable description, infecting the surrounding atmosphere with pestilential impurities. In such localities, a shower of rain must be looked upon rather as an evil than as a means of doing good, for as the water cannot escape, it stirs up the vast amount of accumulated abomination, thereby producing the most dreadful effluvia. The interiors of dwellings in places of this description never become clean: they are kept nearly in the same state as the ground out of doors; thus the floors and walls of such dwellings are being continually luted over with foul matter, and the inhabitants, instead of keeping the floors cleansed by washing, actually endeavour to do so periodically by scraping them with a shovel or other instrument. In fact, these disgraceful dens of filth and neglect cannot be considered in any other light than as vast corrupt dung-heaps.

The building of cesspools and bottoms of drains is usually performed with bricks laid without mortar, the consequence of which is, that the surrounding earth becomes saturated from the permeation of the sulliage matter through their interstices. This is frequently observable in making excavations, where, in taking up the old cesspools and drains, the ground adjacent and for some considerable distance is found blackened from the soaking of the sulliage matter. The foundations of the walls, and the walls themselves, often become saturated from the same cause. Flourings also become rotten, from the esurine acid which is exuded, and a kind of oxydation is also found to gather on the surface of the ground and on the underside of the flooring. The fœtid odour evolved by evaporation from the saturated ground and walls finds its way through the chinks of the flooring, and thus the whole atmosphere within the house becomes tainted; this process is continually going on, for as evaporation takes place, the ground is receiving incessant supply from the permeation through the interstices of the brickwork.

Besides the insalubrity of the atmosphere, produced from the evaporation of the stagnant accumulations on the surface of badly drained localities, as well as the saturated ground from cesspools and drains, the malaria emitted from the decomposed animal matter retained within the cesspools, is of a poisonous and highly noxious character, very frequently producing typhus and other infectious fevers. Considerations of public health, therefore, point out the immediate necessity of providing a wide and extended system of efficient house drainage. The use of open, permeable cesspools ought to be entirely prohibited, as, by allowing the retension of the more solid matter within such receptacles, the effluvium emitted therefrom is productive of the most injurious effects, and for the future the construction of such ought not to be tolerated under any circumstances.

To insure perfect house drainage, it is most essential that a sewer be formed and carried up to the front of each tenement, and that a perfect and properly-formed drain be made therefrom, to communicate directly with such sewer. It is also essential that the sulliage from each tenement be carried off through the drain into the main sewer as fast as engendered, and with the greatest despatch possible. The purpose of sewers is to afford ready means to receive and carry off the drainage of premises; but the pains taken in the construction of the sewers to give them the proper form and fall, are rendered entirely useless while cesspools and drains are not at the same time kept clear. This is best effected by an abundant and well-regulated supply of water passing through them, for no drain, however formed, can be effective in producing complete and rapid transmission of soil to the main sewer otherwise than by this power. Hence, no system of house drainage can be considered perfect that does not include the proper construction of and cleansing of both drains and sewers by an abundant supply of water, for they are so combined, that they may be considered as one.

Each individual is now allowed to carry a drain from within a few feet of the sewer, according to his own fancy, the part next the sewer being generally built by the Commissioner of Sewers, consequently drains are not made with that due consideration of their use which the nature of the subject demands. So long as a drain is made, it is considered sufficient, and being under ground and unseen, it is consequently less thought of. Proper construction is seldom or never attended to, and drains are made of all manner of shapes, and very frequently of the worst possible materials. The obtainable fall is scarcely ever strictly regulated so as to produce the greatest effect; and the junctions with the main sewer and with each other are generally formed in a very imperfect manner. The usual workmanship of drains, after the first 3 feet, is executed in an improper and slovenly style, the interior surface of the brickwork being made very undulating and rough, and in turning the upper arched work, pieces of mortar fall from the joints to the bottom, where they lie and become hard, and in consequence present a series of obstructions along the whole extent of the drain. While the inventive faculties are usually put to the utmost test upon the other details of a building for the purpose of producing effect and good workmanship, this most essential adjunct is neglected, the proper form, size, construction, and general efficiency of drains being seldom considered.

From the examinations which are constantly being made into complaints of the stoppages of drains, the cause of stoppage is generally found to arise from the drains themselves, and not from any accumulations in the sewers: in fact, this is nearly always the case. The forms of the drains and the irregularities of their falls, the unevenness of the surface, and the pieces of mortar which lie on the bottom, as well as the badly-formed collateral junctions, are the general causes of stoppages, but the principal reasons arise from the drains being too large, and from an inadequate supply of water to carry off the soil; as it is, drains generally form receptacles for retaining within them matter which they were intended to convey away.

The size of every drain should be consistent with the size of the building, and the quantity of water and matter likely to pass through it; for if a drain be made too large, the water will be spread over a wide surface, the velocity of the stream will be diminished in proportion, and, in consequence, it will not have sufficient power to carry away the soil, and eventually the drains will become choked. A disproportionably large-sized drain is more likely to become choked with the same quantity of water and matter passing through it than one of a smaller size; for, when contracted, the water, having a greater depth and velocity, is better able to carry off any obstructions which it may meet with in its course.

Drains to sewers should be carried in direct lines right through premises, and their falls should be regulated so as to form perfect inclinations from their heads to the sewers. The lateral junctions of drains should be curved in the direction of the fall of the stream, otherwise deposits will be formed at those junctions. The interior surfaces of drains should be even, uniform, and smooth, for the purpose of facilitating the passage of the sulliage water and matter, and also to prevent any adhesion to their sides. They should also, if possible, be formed perfectly water-tight, so as to prevent the permeation of the sewerage. Wherever an inlet is formed to a drain, an efficient trap air and water-tight should be constructed, to prevent the escape of any noxious and offensive smells; and the neck of the soil-pan of every water-closet should be connected immediately with a properly-formed water-tight trap, communicating with the drain.

The power of a stream running in a cylindrical pipe is the greatest at the axis, and gradually decreases from thence towards the surface of the pipe where it is least. The forms of drains should be made as much as possible in accordance with the natural action of running water. The circular form suits nearly that action, therefore flat-bottomed and upright-sided drains should never be made. The sectional area of a drain of twelve inches diameter is sufficient, if properly constructed and managed, to carry off the sewage of several houses; but, from conflicting interests, it is far preferable and much more convenient that each tenement have a separate drain communicating directly with the main sewer in the street. As was previously observed, the size of a drain should be in proportion to the area of the building, the adjacent ground to be drained, and the quantity of water conveyed thereto. If drains were thus proportioned, the present supply of water would be found nearly effectual in preventing any accumulations and consequent obstructions within them. The effect of the present supply of water is rendered of little avail in consequence of the size of the drains, as at present constructed. Therefore, in order to render the action of water more certain, when collected within drains, it is absolutely necessary that their size should be considerably reduced, which being done, accumulation would be next to impossible: the soil would be carried off into main sewers, instead of being retained within cesspools and drains; and by a proper and well-regulated system of sewerage, the refuse-water from every drain could be rendered available for keeping the sewers themselves perfectly clear from accumulations of soil.

Drains of from 4 to 8 inches diameter are of capacity sufficient to afford efficient drainage from any ordinary dwelling-house, and as the best and most effectual form is nearly that of a cylinder, and as it is not practicable to build them of such small sizes, and of such a form with common brick, we should look to another material for their construction. The ordinary common drain-tiles seem to answer the purpose extremely well; but, as it has become requisite to reduce the subject to a clearly defined system, in order to supersede the present ill-constructed brick conduits, these tiles do not afford any very great advantage over them. The most efficacious manner of constructing drains would be with thick, strong clay pipes, well burned, and glazed inside; made of an entire piece nearly of a circular form, and of a length convenient for use, so that the end of one pipe could fit into the next without forming a protrusion within it. Drains thus formed and carried in direct lines with regular inclinations to sewers, with proper curved junctions, all properly laid, and with an efficient and well-regulated supply of water, would be effectual in carrying off the sulliage and keeping themselves perfectly free from accumulations, for the calibre being smaller, the stream would be more contracted, and in consequence would have greater velocity. The smoothness of surface produced by glazing would vastly facilitate passage through them. With proper apparatus they could be cleansed if required at any time, precisely in the same manner as chimneys are now swept, consequently breaking up floors and paving, with all the accompaniments of foul stench, and

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